

APPLICATIONS

- Immune System Support
- Skin Support
- Antioxidant Support
- Gastrointestinal Support



INTRODUCTION

Zinc is an essential trace mineral and a cofactor in many biological processes, including catalytic reactions, intracellular signaling, and DNA and protein synthesis.¹ It is an integral part of normal immune function, healthy skin, and normal wound healing.² Zinc may provide antioxidant support, help to maintain healthy mitochondrial function, and help to support epithelial barrier function and gut permeability already within the normal range.^{3,12} The molecular formula for zinc bisglycinate is $C_4H_{12}N_2O_5Zn$.³

Zinc supplements are widely available and consist of chelates bound to organic acids, chelates bound to amino acids, and non-chelates bound to inorganic acids. Zinc chelates are generally more bioavailable as they are less likely to interact with food, drugs, or components of the intestinal lumen.⁴ Zinc chelates bound to organic acids include zinc aspartate, zinc methionine, zinc monomethionine, and zinc bisglycinate. Zinc chelates bound to amino acids include zinc acetate, zinc citrate, zinc gluconate, zinc orotate, and zinc picolinate. Zinc non-chelates bound to inorganic acids include zinc sulfate and zinc oxide.⁴

NutraMedix Zinc is in the form of zinc bisglycinate, a chelate consisting of two glycines bound to a zinc cation (Zn^{2+}). Zinc bisglycinate is highly bioavailable, having a low molecular weight which facilitates passage through the cell membrane.^{5,6} In a randomized crossover single-dose trial, zinc bisglycinate was significantly more bioavailable (+43.44%) than zinc gluconate ($p < 0.05$).⁵ In a subsequent double-blind placebo-controlled trial, 30 healthy women ages 18-24 were assigned to 60 mg/day for six weeks of either zinc bisglycinate or zinc gluconate. Zinc bisglycinate was again found more bioavailable than zinc gluconate.⁶

The recommended dietary allowance (RDA) of zinc for ages 19 and older is 8 mg/day for women and 11 mg/day for men.⁷ Zinc deficiency, while relatively rare in high-resource nations, can be caused by low zinc intake, high phytate intake, or long-term use of proton pump inhibitors.⁸ It can also occur in individuals

undergoing hemodialysis.⁹ Zinc deficiency is estimated to affect 17% of the world's population, due to inadequate nutrition, severe illness, or alcoholism.¹⁰ Signs of zinc deficiency include delayed growth and maturation, impaired cognition, and depressed immunity, among others.¹¹

Zinc is most abundant in animal foods, though can be found in plant foods and fortified foods as well. Good sources of zinc include seafood such as oysters, lobster, and crab; meats such as beef, chicken, and pork; nuts such as cashews and almonds; and pumpkin seeds. Oysters are, by far, the richest dietary source of zinc. Fortified sources include breakfast cereals, which are fortified with 25% of the daily value (DV).¹²

Vegetarian and vegan diets can decrease zinc absorption due to the high phytic acid content of whole grains and legumes. However, there is currently insufficient evidence showing a higher incidence of zinc deficiency in vegetarians, compared to omnivores.^{13,14} While zinc from animal foods is more easily absorbed, soaking grains and legumes overnight may help to increase the bioavailability of zinc by activating phytase to break down phytic acid.^{15,16}

NutraMedix rigorously follows current good manufacturing practices (cGMP), as do our suppliers. Our Zinc is free of gluten, sugar, soy, and dairy. It is also free of GMOs, mold, and yeast.

IMMUNE SYSTEM SUPPORT

Zinc may help with healthy immune system support.^{17,18} Normal zinc levels help to support the natural killer (NK) cells of innate immunity as well as the T and B cells of adaptive immunity, maintaining them already within the normal range.¹⁹ Zinc deficiency may contribute to immune dysregulation, decreased lymphocytes, decreased NK cells, and increased monocyte toxicity.¹⁹ Normal zinc levels are necessary for healthy hematopoiesis, normal cell differentiation, and healthy cell cycle function.¹⁹ Both deficiency and excess can negatively impact the immune system, and zinc homeostasis is needed for correct functioning of both innate and adaptive immunity.¹⁹ One systematic review and meta-analysis found that zinc helped to support upper respiratory health ($p = 0.0004$).²⁰

SKIN SUPPORT

Zinc may help with skin support.* Zinc is prevalent in the epidermis, the majority of which is located in the stratum spinosum. Zinc homeostasis is maintained by zinc transporters (ZnTs); Zrt-, Irt-like proteins (ZIPs); and metallothioneins. Zinc leaves the cells through ZnTs and enters the cells through ZIPs.²¹ Zinc helps to maintain MHC class II expression already within the normal range in dendritic cells, and helps to maintain normal mast cell function.²¹ Zinc deficiency can contribute to rough skin, and supplemental zinc may help to maintain healthy skin. Additionally, zinc may help to support normal wound healing.^{21,22}

ANTIOXIDANT SUPPORT

Healthy zinc levels may help with antioxidant support, while both deficiency and excess can contribute to oxidative stress.* Zinc is unable to participate in redox reactions, as its valence shell is full. Instead, its antioxidant activity is attributed to effects on copper/zinc-superoxide dismutase and the upregulation of metallothionein, among other mechanisms.²¹ Zinc's antioxidant effects may involve proteins such as NF-kappaB, PPARs, and Nrf2.²¹ In a randomized, double-blind, placebo-controlled trial, zinc helped to support premenstrual physical health ($p = 0.03$) and mental health ($p = 0.006$) already within the normal range, compared to placebo. Zinc also helped to maintain brain-derived neurotrophic factor (BDNF) already within the normal range ($p = 0.01$) and total antioxidant capacity (TAC) already within the normal range ($p < 0.001$).²³

OTHER USES

Gastrointestinal Support

Zinc may support gastrointestinal health.²⁴ Zinc and gastrointestinal epithelial cells have a reciprocal relationship; zinc is needed for a healthy epithelium, and a healthy epithelium is needed for the absorption of dietary or supplemental zinc.²⁵ Zinc may help to support healthy gastrointestinal epithelial barrier function at tight junctions and may help to maintain healthy gastrointestinal permeability already within the

